



Indiana's academic standards for science contain six standards. Each standard is described below. On the pages that follow, age-appropriate concepts are listed underneath each standard. These ideas build a foundation for understanding the intent of each standard.

Standard 1 — The Nature of Science and Technology

It is the union of science and technology that forms the scientific endeavor and that makes it so successful. Although each of these human enterprises has a character and history of its own, each is dependent on and reinforces the other. This first standard draws portraits of science and technology that emphasize their roles in the scientific endeavor and reveal some of the similarities and connections between them. In order for students to truly understand the nature of science and technology, they must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

Standard 2 — Scientific Thinking

There are certain thinking skills associated with science, mathematics, and technology that young people need to develop during their school years. These are mostly, but not exclusively, mathematical and logical skills that are essential tools for both formal and informal learning and for a lifetime of participation in society as a whole. Good communication is also essential in order to both receive and disseminate information and to understand others' ideas as well as have one's own ideas understood. Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an integral component of students' experiences in science.

Standard 3 — The Physical Setting

One of the grand success stories of science is the unification of the physical universe. It turns out that all natural objects, events, and processes are connected to each other. This standard contains recommendations for basic knowledge about the overall structure of the universe and the physical principles on which it seems to run, with emphasis on Earth and the solar system. This standard focuses on two principle subjects: the structure of the universe and the major processes that have shaped planet Earth, and the concepts with which science describes the physical world in general – organized under the headings of *Matter and Energy* and *Forces of Nature*. In Grade 3, students learn that most changes that occur on Earth and in the sky are observable.

Standard 4 — The Living Environment

People have long been curious about living things – how many different species there are, what they are like, how they relate to each other, and how they behave. Living organisms are made of the same components as all other matter, involve the same kinds of transformations of energy, and move using the same basic kinds of forces. Thus, all of the physical principles discussed in Standard 3 – The Physical Setting, apply to life as well as to stars, raindrops, and television sets. This standard offers recommendations on basic knowledge about how living things function and how they interact with one another and their environment. In Grade 3, students learn that adaptations in physical structure or behavior may improve an organism's chance for survival.



Standard 5 — The Mathematical World

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life — problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

Standard 6 — Common Themes

Some important themes pervade science, mathematics, and technology and appear over and over again, whether we are looking at ancient civilization, the human body, or a comet. These ideas transcend disciplinary boundaries and prove fruitful in explanation, in theory, in observation, and in design. A focus on *Constancy and Change* within this standard provides students opportunities to engage in long-term and on-going laboratory and field work, and thus understand the role of change over time in studying The Physical Setting and The Living Environment.



Standard 1

The Nature of Science and Technology

Students, working collaboratively, carry out investigations. They question, observe, and make accurate measurements. Students increase their use of tools, record data in journals, and communicate results through chart, graph, written, and verbal forms.

The Scientific View of the World

- 3.1.1 Recognize and explain that when a scientific investigation is repeated, a similar result is expected.

Scientific Inquiry

- 3.1.2 Participate in different types of guided scientific investigations, such as observing objects and events and collecting specimens for analysis.
- 3.1.3 Keep and report records of investigations and observations* using tools, such as journals, charts, graphs, and computers.
- 3.1.4 Discuss the results of investigations and consider the explanations of others.

* observation: gaining information through the use of one or more of the senses, such as sight, smell, etc.

The Scientific Enterprise

- 3.1.5 Demonstrate the ability to work cooperatively while respecting the ideas of others and communicating one's own conclusions about findings.

Technology and Science

- 3.1.6 Give examples of how tools, such as automobiles, computers, and electric motors, have affected the way we live.
- 3.1.7 Recognize that and explain how an invention can be used in different ways, such as a radio being used to get information and for entertainment.
- 3.1.8 Describe how discarded products contribute to the problem of waste disposal and that recycling can help solve this problem.



Standard 2

Scientific Thinking

Students use a variety of skills and techniques when attempting to answer questions and solve problems. They describe their observations accurately and clearly, using numbers, words, and sketches, and are able to communicate their thinking to others.

Computation and Estimation

3.2.1 Add and subtract whole numbers* mentally, on paper, and with a calculator.

* whole number: 0, 1, 2, 3, etc.

Manipulation and Observation

3.2.2 Measure and mix dry and liquid materials in prescribed amounts, following reasonable safety precautions.

3.2.3 Keep a notebook that describes observations and is understandable weeks or months later.

3.2.4 Appropriately use simple tools, such as clamps, rulers, scissors, hand lenses, and other technology, such as calculators and computers, to help solve problems.

3.2.5 Construct something used for performing a task out of paper, cardboard, wood, plastic, metal, or existing objects.

Communication Skills

3.2.6 Make sketches and write descriptions to aid in explaining procedures or ideas.

Critical Response Skills

3.2.7 Ask “How do you know?” in appropriate situations and attempt reasonable answers when others ask the same question.

Standard 3

The Physical Setting

Students observe changes of Earth and the sky. They continue to explore the concepts of energy and motion*.*

The Universe

3.3.1 Observe and describe the apparent motion of the sun and moon over a time span of one day.

3.3.2 Observe and describe that there are more stars in the sky than anyone can easily count, but they are not scattered evenly.



- 3.3.3 Observe and describe that the sun can be seen only in the daytime.
- 3.3.4 Observe and describe that the moon looks a little different every day, but looks the same again about every four weeks.

* energy: what is needed to make things move

* motion: the change in position of an object in a certain amount of time

Earth and the Processes That Shape It

- 3.3.5 Give examples of how change, such as weather patterns, is a continual process occurring on Earth.
- 3.3.6 Describe ways human beings protect themselves from adverse weather conditions.
- 3.3.7 Identify and explain some effects human activities have on weather.

Matter* and Energy

- 3.3.8 Investigate and describe how moving air and water can be used to run machines like windmills and waterwheels.

* matter: anything that has mass* and takes up space

* mass: a measure of how much matter is in an object

Forces of Nature

- 3.3.9 Demonstrate that things that make sound do so by vibrating, such as vocal cords and musical instruments.

Standard 4

The Living Environment

Students learn about an increasing variety of organisms. They use appropriate tools and identify similarities and differences among them. Students explore how organisms satisfy their needs in typical environments.

Diversity of Life

- 3.4.1 Demonstrate that a great variety of living things can be sorted into groups in many ways using various features, such as how they look, where they live, and how they act, to decide which things belong to which group.
- 3.4.2 Explain that features used for grouping depend on the purpose of the grouping.
- 3.4.3 Observe that and describe how offspring are very much, but not exactly, like their parents and like one another.



Interdependence of Life and Evolution

- 3.4.4 Describe that almost all kinds of animals' food can be traced back to plants.
- 3.4.5 Give examples of some kinds of organisms that have completely disappeared and explain how these organisms were similar to some organisms living today.

Human Identity

- 3.4.6 Explain that people need water, food, air, waste removal, and a particular range of temperatures, just as other animals do.
- 3.4.7 Explain that eating a variety of healthful foods and getting enough exercise and rest help people stay healthy.
- 3.4.8 Explain that some things people take into their bodies from the environment can hurt them and give examples of such things.
- 3.4.9 Explain that some diseases are caused by germs and some are not. Note that diseases caused by germs may be spread to other people. Also understand that washing hands with soap and water reduces the number of germs that can get into the body or that can be passed on to other people.

Standard 5

The Mathematical World

Students apply mathematics in scientific contexts. Students make more precise and varied measurements when gathering data. Based upon collected data, they pose questions and solve problems. Students use numbers to record data and construct graphs and tables to communicate their findings.

Numbers

- 3.5.1 Select and use appropriate measuring units, such as centimeters (cm) and meters (m), grams (g) and kilograms (kg), and degrees Celsius (°C).
- 3.5.2 Observe that and describe how some measurements are likely to be slightly different, even if what is being measured stays the same.

Shapes and Symbolic Relationships

- 3.5.3 Construct tables and graphs to show how values of one quantity are related to values of another.
- 3.5.4 Illustrate that if 0 and 1 are located on a line, any other number can be depicted as a position on the line.

Reasoning and Uncertainty

- 3.5.5 Explain that one way to make sense of something is to think of how it relates to something more familiar.



Standard 6

Common Themes

Students work with an increasing variety of systems and begin to modify parts in systems and models and notice the changes that result. They question why change occurs.

Systems

- 3.6.1 Investigate how and describe that when parts are put together, they can do things that they could not do by themselves.
- 3.6.2 Investigate how and describe that something may not work if some of its parts are missing.

Models and Scale

- 3.6.3 Explain how a model of something is different from the real thing but can be used to learn something about the real thing.

Constancy and Change

- 3.6.4 Take, record, and display counts and simple measurements of things over time, such as plant or student growth.
- 3.6.5 Observe that and describe how some changes are very slow and some are very fast and that some of these changes may be hard to see and/or record.



NOTES

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